Andrew Young School of Policy Studies
Research Paper Series

Working Paper 07-28
May 2007

Department of Economics
Fiscal Research Center

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Jan. 2007

* This research was supported by Island Press and Defenders of Wildlife. I thank Stan Wellborn, Janet Hodur, and especially Puja Jawahar of RFF, who contributed to this paper. I also thank Alan Krupnick, Frank Casey, Robert Lilieholm, Kristy Manning, Margaret Walls, and Laura Watchman for their many comments and suggestions, and numerous authors and members of land trusts who gave their time to comment on their research.

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Abstract:

Over the past three decades, the economics profession has developed methods for estimating the public benefits of green spaces, providing an opportunity to incorporate such information into land-use planning. While federal regulations routinely require such estimates for major regulations, the extent to which they are used in local land use plans is not clear. This paper reviews the literature on public values for lands on urban outskirts, not just to survey their methods or empirical findings, but to evaluate the role they have played—or have the potential to play—in actual land use plans.

Based on interviews with authors and representatives of funding agencies and local land trusts, it appears that academic work has had a mixed reception in the policy world. Reasons for this include a lack of interest in making academic work accessible to policy makers, emphasizing revealed preference methods which are inconsistent with policy priorities related to nonuse values, and emphasis on benefit-cost analyses. Nevertheless, there are examples of success stories that illustrate how such information can play a vital role in the design of conservation policies.

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I. Introduction

Private markets can be an efficient way to allocate many resources, but they can fail to take account of public benefits that do not flow to the participants in market transactions. Many of the public benefits of undeveloped lands, whether natural or agricultural, share this characteristic. Remote wilderness may support ecological diversity; city parks may support recreation for thousands of people. In between the two, natural undeveloped land on city outskirts, while rarely supporting rich ecological diversity, can still provide critical habitat for endangered native flora and fauna. It can help purify surface and groundwater, improve air quality, and keep the region cooler in the summertime. It can provide a place for hiking and other recreation. And it can provide an aesthetic view and a sense of serenity lost in city developments.

For all of these reasons, accounting for the public benefits of undeveloped lands on city outskirts must play a crucial role in city planning. Over the past three decades, the economics profession has developed methods for estimating these public benefits empirically, providing an opportunity to incorporate such information into actual land-use planning. While federal regulations routinely require such estimates for major regulations, the extent to which they are used in local land use plans is not clear.

This paper reviews the literature on public values for lands on urban outskirts, not just to survey their methods or empirical findings, but with a unique goal in mind: to evaluate the role they have played—or have the potential to play—in actual land use plans. Toward that end, we have contacted many of the authors of the reviewed studies, together with funding agencies and

local land trusts, to discuss the studies' goals and how they have actually been used. In this respect, this literature review differs from other, more extensive, review of values for "open space" by McConnell and Walls (2005) and Fausold and Lilieholm (1996, 1999). Those reviews cover open space in rural areas and within the urban center, as well as on urban outskirts, but do not address the role the papers have played in the policy process. While those reviews will be more useful for those seeking a comprehensive catalog of open space research, this review will be of interest to economists and policy analysts interested in how their work might be used in policy-making, to land use planners interested in understanding how they might make use of economic research, and to extension agents and others working to bridge the gap between the two.

This paper focuses on lands on urban outskirts because these lands are truly up for grabs in the scrum of urban development. The paper begins by reviewing the various benefits to preserving undeveloped lands, and discusses which of these benefits households emphasize over other types, and which are likely to be provided by various types of undeveloped land. In Section 3, it reviews specific studies and the way they have been used in the policy process. Section 4 concludes.

II. Why do Households Value Undeveloped Lands on Urban Outskirts?

It is evident that urban and suburban households increasingly value the conservation of their nearby undeveloped lands. According to the data collected by the Land Trust Alliance and the Trust for Public Land, from 2000 to 2006 there were 1,269 US ballot measures targeting such conservation, of which some 75% were successfully adopted. The movement is widespread, encompassing over 40 states, and continues to build momentum, with 134 measures authorizing

total expenditures of almost $7 billion passing in 2006.[1]

There are many good reasons households might desire conservation of undeveloped lands. To investigate their motives, Kline and Wichelns (1996) presented nine potential motives to a sample of Rhode Island residents. The nine reasons, ranked by households in order of importance, were:

1. Protecting groundwater,
2. Protecting wildlife habitat,
3. Preserving natural places,
4. Providing local food,
5. Keeping farming as a way of life,
6. Preserving rural character,
7. Preserving scenic quality,
8. Slowing development, and
9. Providing public access.

The nine reasons might be clustered into four more general ones: environmental (1-3), agrarian (4-5), aesthetic (6-7), anti-growth (8), and recreational (9). Of these reasons, respondents clearly prioritize the environmental ones, putting all three at the top. Surprisingly, the more self-interested reasons of aesthetics and recreation are ranked at the bottom.

In a study of residents in the small town of Petoskey, MI, Krieger (2004) found a similar pattern. He asked respondents to rank these same five broad reasons for preserving undeveloped lands. They ranked "environmental objectives" as the most important, with "growth management" second, agrarian third, aesthetic fourth, and, again, recreational last.

Rosenberger (1998) presented a related list to residents and tourists in Routt County, CO, home of Steamboat Springs and an important resort area experiencing pressures for development. Rosenberger's list is somewhat different, ranking not "reasons" but "assets." That is, both

[1] See http://www.tpl.org/tier2_rp2.cfm?folder_id=2386. Kotchen and Powers (2006) and Nelson, Uwasu, and Polasky (2006) have discussed and analyzed these referenda.

natural features and man-made objects and institutions are ranked for their "contributions to the enjoyment of living in and visiting Routt County." The list consists of 43 items, encompassing protection of the environment, aesthetic amenities, recreation, salient features of Western American culture (speech, food, etc.), and so forth. Even on this large list, however, environmental assets rise to the top. Moreover, natural assets like wildlife or forests rank higher than purely recreational asset like trails and agrarian assets like ranchlands.

Finally, Krieger (1999) offers a fourth and very useful qualitative assessment of reasons for conserving lands. He studied the loss of farmland and open space in the Chicago metropolitan area. Like Kline and Wichelns (1996), he offered a list of nine reasons for protecting farmland and, separately, more generic "open space" from development. Krieger finds that for farmland, the so-called "agrarian" reasons score much higher than either aesthetic or environmental reasons. However, for other open space, protecting wildlife habitat scores at the top, while aesthetic amenities generally score in the middle. In both cases, "public access," a recreation-type amenity, again scores at or near the bottom.

Triangulating on these studies allows us to gain important insights into people's reasons for protecting lands from development. First, as shown in Krieger (1999), people correctly understand that farmland does not have the same ecological value as other types of land cover. In the case of non-agricultural lands, ecological and environmental values do rise to the top. Moreover, Rosenberger (1998) finds that people would rank such lands above agricultural lands and urban "open spaces." Finally, Kline and Wichelns (1996) and Krieger (2004) confirm the implication that ecological and environmental values are at the top of the list of reasons for protecting lands from development.

These results are a crucial part of the background framing the valuation studies discussed

below. If they are to be believed, the results suggests that much of the emphasis of open space policies on protecting farmland and “rural character” may be misplaced, because such policies would fail to target the most ecologically valuable lands. They also suggest that stated preference research, which is capable of estimating ecological and other non-use values, is most likely to provide the information needed by policy-makers.

III. Review of Studies of Public Values for Undeveloped Lands on Urban Outskirts.

These and other themes are explored in the remainder of the paper, which goes on to review nonmarket valuation studies of land conservation, and the role they have played in planning. The review is organized by the methodological approaches of the researchers.

Stated Preference Studies

The stated preference (SP) method uses surveys to elicit willingness to pay from households by constructing a hypothetical scenario and "market" (Mitchell and Carson 1989). SP surveys generally have four main steps. First, a broad policy context is set and people are asked to think about their priorities. Second, a specific policy context is set (e.g. issues related to urban sprawl and land use) and a plan is put forth to achieve a specific objective. This plan should involve some concrete and realistic "payment vehicle" through which funds would be raised. Third, households are asked to indicate how much they are willing to pay for a program, caste a hypothetical vote in favor of or against a program, or make a choice among alternative programs. The fourth and final step is to ask various demographic and attitudinal questions of the respondents, and to probe on their understanding and acceptance of the information conveyed.

Unlike so-called revealed preference (RP) methods which rely on households actual behavior in markets, SP methods are vulnerable to the criticism of being purely hypothetical. However, while RP studies might capture recreational and aesthetic values at least as well, only SP

studies can capture pure ecological values (or “nonuse” values) unrelated to any market activities. Thus, SP methods can play a unique role, especially given the importance of ecological values noted in the previous section.

As part of the qualitative work of Rosenberger (1998) described above, Rosenberger and Walsh (1997) studied residents' values for preserving ranchland in the Yampa River Valley in Routt County, Colorado. The area lost approximately 20% of its valley ranchland between 1990 and 1995. These lands are used primarily for grazing, but provide important habitat for elk and migratory birds, and serve as a riparian buffer for the Yampa River. In response to this development, the County Board of Commissioners, the Governor, and other groups such as The Nature Conservancy have attempted to preserve land through zoning, regulation, and purchases. Tourist industries, such as the ski resorts, also were behind the conservation as a way to improve their amenities and to restrict competition.

Rosenberger and Walsh elicited willingness to pay (WTP), in the form of higher taxes, for a county protection program. Respondents were asked to specify their preferred level of protection (25% to 100% of the County's ranchland) and then were asked their willingness to pay for that level. Their estimated WTP values, extrapolated to all the households in Routt County, imply a total value of about $50 per acre—not enough to justify large purchases on benefit-cost grounds.

In a companion study of tourists, Rosenberger and Loomis (1999) used the travel cost method to estimate how much tourists were willing to pay for trips to the area, supplemented with "contingent behavior" data for surveys on how their travel patterns would change if all the ranch open space were developed, including tourist-related development. The vast majority of tourists stated that the aesthetic contribution of the ranchlands was an important part of their trip.

Although the published study found that replacing ranchland with tourist infrastructure would not lead to a decrease in trips, for a larger sample, however, it was found that trips would definitely decline if ranchland were lost.[2]

These studies were introduced into the policy process in a number of ways, including a special extension bulletin circulated among stakeholders, a public workshop, numerous meetings with land trusts and other stakeholders, and participation in the county's annual economic summit. Despite the fact that values were generally small relative to land prices, insofar as residents were willing to pay something and insofar as tourism was likely to be negatively impacted, the work was viewed as supporting conservation. In 1995, the work was referenced in new land-use planning rules (the "Open Lands Plan"). This plan declared that farming and ranching could not be deemed nuisances, and established Land Preservation Subdivision Regulations that encouraged clustering of new homes and preservation of remaining parcels with agricultural and/or ecological values. In 1997, citizens further approved a Purchase of Development Rights (PDR) tax that averages $20 per property per year.[3] The PDR program continues to be funded, and a follow-up study has been commissioned to establish a basis for the continued justification of the program.

In a study undertaken not far away, in Loveland, Colorado, Loomis et al. (1999) elicited household WTP, through sales taxes, for a program that would protect open space through land purchases. They estimated that households were willing to spend an average of $108 for recrea-

[2] Personal communication with Randall Rosenberger. See also Routt County Extension Office (undated).

[3] Personal communications with Randall Rosenberger and C.J. Mucklow, the county extension agent. See also Colorado State University (2002).

tion lands or $116 for nature lands. The study was presented to a local land commission, who designed a 2003 conservation ballot initiative.[4] Unfortunately, the initiative did not seem to follow the research findings closely enough, for it asked for $6m in funds, or $162 for every adult in Loveland. This cost is clearly higher than the estimated average preferred contribution, and probably higher still than the median, the level which would garner a 50% approval. Not surprisingly, then, the initiative lost, receiving only 43% of the vote.

Based in part on this experience, in more recent work Kerri Rollins, one of the authors, has used more qualitative survey methods to estimate support for protecting lands at various levels, support for preference in using conservation easements (which would protect wildlife habitat) versus fee-simple purchases (which would also allow public access for recreation), and interest in wilderness and recreation. This work has been used to create a master plan for Larimer County, Colorado, that would follow a 50/50 balance between conservation easements and purchases.

As part of his qualitative work described above, Krieger (1999) studied the WTP of Chicago-area residents to stem the loss of farmland and other undeveloped lands. From 1982 to 1992, 15% and 8% of land in Kane and McHenry counties, respectively, was converted from agriculture to other uses, while 61 and 64% remained agricultural. About 76% of respondents were willing to support an open space program at a cost of $5 per year, for five years, to protect 20,000 acres of farmland in their county. Fifty-seven percent supported it at a cost of $100 per year, and 45 percent supported it at a cost of $170 per year.

Commissioned by American Farmland Trust's Center for Agriculture in the Environment, this work was communicated via a large press conference, to media reaching millions of people.

[4] Personal communication with Kerri Rollins.

American Farmland Trust had created stakeholder committees which have used the report to lobby local county boards, and have just recently won the opportunity to place a PDR program on the ballot. The information about how much people were willing to pay, but also the qualitative information which showed people ranked open space as a top issue, were especially persuasive in this outcome.[5]

Krieger (2004) also studied WTP values in his work in Petoskey, MI, a city of about 14,000 people on Lake Michigan. Although small, Petoskey's population had grown nearly 20 percent from 1990 to 2000 and its housing units by 24 percent, while losing agricultural and forest lands. The City of Petoskey and two neighboring townships created a Land Conservancy Task Force, which included the mayor as well as local citizens, to write a PDR ordinance, which would qualify the area for State matching grants. They commissioned the work of Krieger (2004) in support of this process.

Although Krieger conducted an SP study, the task force's interest was not in average benefits per se, that is, not in the usual information required for a benefit-cost analysis. Rather, it was interested in information on whether there was support for a property tax millage to fund the PDR program. But when the payment vehicle of the survey is a property tax, that is precisely the information that a traditional contingent valuation study provides. About 65% of households supported the millage if it cost their household $4 per year, with support dropping steadily to a 50% if it cost $105 per year. These results were presented to the task force and presented at a "reasonably well attended" public meeting. Despite the initial interest and the supporting data

[5] Personal communication with Ann Sorenson, Assistant Vice President for Research, American Farmland Trust.

however, a lack of leadership seems to have stalled the program.[6]

The final SP case study is Breffle et al. (1998). They elicited responses from residents of a Boulder neighborhood about their willingness to pay to preserve the Cunningham property, a 5.5 acre parcel slated for development. Bordering other protected lands abutting the foothills of the Rocky Mountains, the property provided some wildlife habitat. It also provided views of mountains and "unofficial access" to a bike path and additional open space.

Breffle et al. surveyed residents within one mile of the property. The sample mean household one-time WTP for preservation of the land was $302, giving a neighborhood-wide value of $774,000. The report was sent to the city council and was received by the Mayor of Boulder, and information was given to the Cunningham Coalition, a neighborhood group. Because of this study and other factors, the City of Boulder decided that annexing the property was not in the best interest of the community, ending all plans for a housing development. Meanwhile, the coalition's attempt to purchase the property in cooperation with another buyer who would erect one modest home was delayed due to difficulties with the financing. Ironically, the developer sold the property to another buyer who intended to build one home—but a home with a pool, tennis court, artificial ponds, golf greens, expansive lawns, and a tall iron fence. While development was limited to one house, these modifications obviously were not consistent with the coalition's original vision of preservation. This story is a cautionary one: even when the information is there to persuade the public and public decision-makers, other resources have to be available to follow through with conservation.

Other recent stated preference studies of the value of undeveloped lands on urban outskirts have not been well incorporated into the policy process, to the best of our knowledge, in-

[6] Personal communication with Douglas Krieger.

cluding such work as Ready et al. (1997) on Kentucky horse farms, Bowker and Didychuk (1994) on eastern Canada, and Kaoru (1993) on wetlands on Martha's Vineyard, and Roe, Irwin, and Morrow-Jones (2004). Roe et al. provide an especially promising study in Columbus, OH. They estimate a "conjoint model" over housing characteristics, including the extent to which a neighborhood's surrounding lands were in agriculture and permanently preserved agriculture. Conjoint studies like this one allow an entire preference function of values over attributes to be estimated, rather than just the support for a single scenario. They find that values for additional protection increase when agricultural lands become scarcer, and that other open spaces, such as parks, may substitute for the services provided by farmland.

SP studies like these have the advantage of capturing nonuse values for open space lands. Moreover, they can provide a rich range of qualitative and quantitative information to stakeholders and planners. As several of these studies indicate, and as those involved in the research dissemination have confirmed, information about the numbers of people expressing support, and the tax levels at which they will maintain their support, can be more important than measures of total value in the politics of persuasion (Rosenberger and Walsh 1997; Krieger 2004). Nevertheless, it should come as no surprise that information alone cannot protect land: organizational leadership and financial resources must also be present. The experience of Breffle et al. (1998) and Krieger (2004) are testaments to this fact.

Although SP research has the advantage of capturing nonuse values, evidence of "real" wealth and income, as incorporated into land values and tourism incomes, can be persuasive as well, as shown in the experience of Rosenberger and Loomis (1999). The next sections turn to studies of such effects.

Hedonic Pricing Studies

The hedonic pricing method is based on the premise that property prices are related to the property's attributes (see Freeman 2003 Ch. 11 and Palmquist 2005). For instance, of two otherwise identical houses in otherwise identical neighborhoods, we would expect the one with the more pleasant surrounding land uses to have a higher value. The difference in prices reflects the economic value of the amenity. The hedonic method does not capture any value from open space that does not accrue to nearby residents, but does provide a partial estimate of open space benefits based on aesthetic values (e.g. views), convenient access to recreation, and cleaner or cooler air conveyed by some types of land cover.

To our knowledge, none of the prominent hedonic studies in the literature have been actively communicated into the policy process.[7] This is surprising, because hedonic studies provide important real-world market tests of the hypothesis that households value open space. Moreover, they do so by linking open space amenities to real estate prices, which, as a measure of the tax base, is important to local planners and which is a frequently used indicator of local economic health. Indeed, the appreciation of land values may be one motivation for supporting conservation (Fischel 2001).

In addition, hedonic studies can yield important insights into the kinds of open space people prefer and into the best ways to protect it. For example, consider the work by Irwin (2002) on the effects of open space on residential property values in Maryland, perhaps the most carefully designed hedonic study of undeveloped lands (see also Irwin and Bockstael 2001). This study gives great care to issues of spatial correlation in the statistical analysis, as well as to the fact that unobserved factors that affect land prices also affect the probability that land remains

[7] We followed up with the authors of Irwin (2002), Irwin and Bockstael (2001), Smith et al. (2002), and Walsh (2006).

undeveloped (tricky problems statistically). The study sheds light on the most valued attributes of open space. In particular, cropland and pasture have more value to neighboring residential properties than neighboring developed land; however, forestland does not.[8] This suggests that open space may be valued by nearby residents for a bucolic aesthetic, rather than for its ecological services.

Perhaps more importantly than her findings about the relative values for types of land uses, Irwin (2002) finds that significant additional benefits are derived from moving from developable open spaces to private or public conservation lands. This suggests that households value undeveloped lands, not just for their current use, but also for the expected use of the open space over the long term. This finding has been observed in other work as well. In a study of forest lands in Grand Rapids, Michigan, Thorsnes (2002) similarly concludes that merely vacant, i.e. undeveloped but unpreserved, forest lands do not have the same effect on nearby lot prices as preserved forest land. In a study in Howard County, Maryland, Geoghegan (2002) likewise finds that permanently conserved land have an affect on nearby lands as much as three times larger than that of developable open space land.

It must be noted that other studies have not supported this hypothesis as consistently, however. More recent work by Geoghegan et al. (2003) in Calvert, Carroll, and Howard Counties, Maryland, has had more mixed results with respect to the value of undeveloped lands. Smith, Poulos, and Kim (2002) similarly were unable to replicate their finding; moreover, being closer to public open spaces appeared detrimental to property values in their study.

A number of additional hedonic studies are reviewed in McConnell and Walls (2005) and

[8] An additional possibility is that a diversity of land uses is important to local residents, but this hypothesis does not appear to be held up in the data (Acharya and Bennett 2001).

Fausold and Lilieholm (1996, 1999). The consensus of this literature is that in most cases land conservation has a positive effect on property prices. With more nuance, the literature suggests that such an effect is more likely in areas with low levels of protection, and for lands that are permanently protected. Hedonic studies generally can capture local aesthetic amenities, but remain more attractive to academic economists and have not been widely disseminated into policy debates. This may be because they cannot capture ecological values. It remains surprising, however, as they provide concrete evidence of real wealth flowing from protected lands and flowing to specific constituencies (landowners). Moreover, as illustrated by these studies, by exploring the multiple attributes of properties, they have the potential to reveal important details about the types of lands valued by people. Thus, they are an underutilized resource for policy-makers.

Transfer Studies

The so-called "benefit transfer method" is not actually an independent way to estimate values, but rather an organized way to use WTP information gathered from one of the above methods in one context for policy questions in a different context (see Desvousges et al. 1998). The transfer method is a useful way to apply lessons from original research—such as the studies reviewed above—to a new policy context. By nature designed to apply existing knowledge rather than to generate or test new hypotheses, transfer methods are a natural choice for stakeholders seeking to evaluate open space benefits in their region.

In an example of such an application, Kiker and Hodges (2005) estimate the economic benefits of natural lands in Northeast Florida, including Jacksonville. Twenty-three percent of this area is developed, with the remainder consisting of roughly equal parts agricultural lands, wetlands, and natural forest. The authors combine together the value added from agriculture and forestry, an estimate of consumer expenditures and surplus from recreation. Furthermore, Kiker

and Hodges transfer benefits from a study by Ready et al. (1997) of Kentucky horse farms as a way to estimate aesthetic amenities provided by the lands.[9] The total estimated value is $2.6b per year. Since the market expenditures represent costs or are already captured in land values, the aesthetic and recreation surplus values totaling $1.8b might be considered a better value for some purposes.

Kroeger (2005) extends Kiker and Hodges's study to a broader range of ecosystem services. He inventories the region's ecosystems, categorizing them into 15 types, from freshwater marshes to forest to brushland. Values for each of 11 services, including water regulation, water supply, habitat, and so forth, for each of these lands, are then transferred from Costanza et al. (1997) and the US Forest Service (2000). In this way, Kroeger estimates that the total economic value of the ecosystem services in the four-county area amounts to approximately $ 3.2 billion annually. Unfortunately, the Costanza et al. study on which this work is based has been criticized by economists on the grounds that it does not sufficiently account for income constraints, with total willingness to pay exceeding worldwide incomes (see e.g. Bockstael et al. 2000).

Although not all economists would accept the validity of these estimates, the NE Florida study provides an excellent example of the way such research can guide policy. Defenders of Wildlife repackaged the results of the Kiker and Hodges study in a shorter report called *Investing in Nature*, intended to bring the issue of the economic contribution of natural areas to the public. These materials in turn helped shape a provision in a major growth management act passed by

[9] One might question the applicability of values for horse farms, which occupy relatively little land but form an important part of Kentucky's character, to all agricultural land in northeastern Florida. However, they do adjust the Ready at all estimate to only 10 percent of their per-acre value.

the Florida legislature in 2005. The provision encourages local governments to require a full cost accounting analysis, which Defenders interprets as including conservation values, for any proposed new development outside the urban service boundary. Thus, such analyses would ensure that conservation and natural lands benefits are evaluated when rezoning and changing land use designations. Furthermore, Defenders of Wildlife obtained a commitment from the bill's sponsor to make the economic value of conservation lands a subject for study.[10]

A second example of a transfer study is a procedure known as Urban Ecological Analysis (UEA), developed by the USDA's Forest Service to quantify the value of urban trees. Trees provide valuable ecological services and processes including groundwater recharge, floodwater management, and filtration of pollutants. To estimate these service flows, the Forest Service has developed the Urban Forest Effects (UFORE) model. From inputs about baseline status plantings, the model first estimates a city's species composition, diameter distribution, and tree health over time. In each future time period, the model then estimates the effect of the trees on reducing air pollution, pollen, and energy use. Finally, cost-avoidance techniques are used to calculate the value of these effects. The basic architecture of UEA is in the form of an integrated assessment benefits transfer, and would be fully consistent with best benefit-cost practices if it used willingness to pay instead of cost-avoidance as its measure of benefits. Adapting the approach in this way would provide better estimates of actual benefits.[11]

As an example, McPhearson et al (1997) studied tree cover in Chicago. They found that

[10] Personal communication with Laurie McDonald of Defenders of Wildlife.

[11] For example, just because the cost of removing dust (were trees not available to remove it) is estimated at such-and-such an amount, does not indicate that people actual benefit from its removal at that amount.

the region's trees remove an estimated 5,575 metric tons of air pollutants annually, providing air cleansing worth $9.2 million, and sequester an estimated 315,800 metric tons of carbon. Increasing tree cover 10% would result in the savings of $50 to $90 per dwelling unit in annual heating and cooling costs. The present value of the services trees provide is estimated as $621 per planted tree, nearly three times costs.

To make their research more accessible to the general public, USDA researchers are developing reports for selected cities. In addition, the conservation organization American Forests is building a user-friendly desktop model for planners across the country (see www.americanforests.org). The Trust for Public Lands is currently using this model to value urban parks and some cities have used UEAs to help manage their undeveloped lands. For example, Roanoke conducted a UEA in 1998 with the Forest Council in partnership with American Forests. As a result of the analysis, more effort is being put into protecting urban trees and green cover. American Forests has also updated its UEA analysis toolpack to allow Roanoke's forestry division to conduct similar analysis on smaller tracts of land.[12]

One point of caution is in order before using UEA in land use planning: it must be emphasized that it captures only the direct services of tree cover to people in the form of values for air quality, water quality, and cooling. It does not estimate values for wildlife or aesthetics. Moreover, because it values only tree cover, in some cases it could lead to perverse findings if not interpreted with care. Much of the undeveloped land around urban areas is agriculture or pastureland that is not covered by trees. As a result, development may well increase the canopy if trees are planted in backyards and along streets. In this case, if other values of undeveloped, but unforested, lands were not accounted for, development would appear to increase values. This

[12] Personal communication with Forestry Division, Roanoke, VA.

cautionary note is not meant as a criticism of UEA, but to note that, as with all analyses, its findings must be interpreted appropriately.

Other Studies

Several other studies and reports, which do not fit neatly into the above categories, have played a prominent role in the wider literature on land conservation and in the public square. One such study is the Sonoran Institute's report on "Prosperity in the 21st Century West" (Rasker et al. 2004a,b). The report estimates the relationship between local income growth and local demographics, geography, accessibility, and land uses. It finds that some Western communities are benefiting from their public lands, but that not all benefit equally. Those with the most accessible amenities (e.g., near an airport) and with more educated workforces benefit the most. In contrast, communities dependent upon resource extraction industries have the slowest long-term growth rates. This report is not a true measure of economic *benefits*, but rather economic impacts on income. The distinction is important because some of the revenues measured in such impact studies do not represent new wealth, but rather transfers of wealth from other locations. Nevertheless, such impacts may better reflect the interests of local governments.

According to Dr Rasker, the study's primary author, the report has caught the attention of policy makers, public land managers and advocacy groups. It has circulated widely, with a 30 page popular version disseminated to over 3000 groups and individuals. The Sonoran Institute has also developed the Economic Profile System (EPS) an automated system to create custom socio-economic profiles for communities in the West. The EPS is available on the institute's website, and the institute conducts training workshops to allow communities to conduct their

own economic analysis.[13] The Institute has also incorporated the *Prosperity* report in all of the field-level trainings conducted for the Bureau of Land Management.

Not unlike hedonic studies, which identify effects of conservation on land values, this report, by emphasizing economic development, has the potential to appeal to greens and green eyeshaders alike. However, the authors of this report have shown more interest and savvy in incorporating it into the policy process. One particularly important step is the creation of literature for a policy-making audience.

Such literature need not be restricted to a single study. Even a well-crafted overview of previous findings can influence policy. One prominent example is the ECONorthwest report on "Economic Benefits of Protecting Natural Resources in the Sonoran Desert" (2002).[14] The document was commissioned by the Coalition for Sonoran Desert Preservation, an umbrella organization for neighborhood and environmental groups in Pima County, AZ. The report lists the various benefits of natural resources and provides illustrative economic values based on previously conducted primary studies. It reviews stated preference studies for intrinsic values in the Southwest, studies of recreational tourism revenues to proxy for recreational values, and hedonic studies. The report has the flavor of a benefit transfer exercise, but as the authors acknowledge stops short of tailoring these values to the Sonoran Desert, as would be required by a transfer. The au-

[13] So far they have conducted daylong workshops in Lewistown, Montana; Great Falls, Montana; and Denver.

[14] Another is Fausold and Lilieholm (1996). Issued by the Lincoln Institute of Land Policy, the report was commissioned by the Boston Foundation. It reviews potential ecological values for open space conservation, and has circulated widely among city officials, planners, and academics (personal correspondence with Robert Lilieholm).

thors conclude that conservation of the Sonoran Desert would yield substantial economic benefits, which should receive full consideration in policy-making, but that continued research is warranted.

This report has been fairly influential in a public campaign begun in 1998 to conserve natural habitat in the Tucson area. While ECONorthwest did not publicize their research, the Coalition released the paper in an outreach campaign designed to positively sway editorial and political opinion toward the Sonoran Desert Conservation Plan.[15] In the fall of 2002, the Coalition presented the paper's findings to the Pima County Board of Supervisors. This launch was followed by a presentation of the paper to the 75-member public steering committee for the Conservation Plan, as well as a large open community forum for residents and other interested parties. Susan Shobe, assistant director of the Coalition, said that a press release was written about the report, and Coalition staff and board members met with the editorial board of local papers, wrote guest editorials, and appeared on local television and radio interview programs. "We felt it was important to explain that people had heard a lot about the costs of protecting undeveloped areas around Tucson, but not enough about the benefits," says Shobe. "The paper was credible and helpful because it came from an independent research organization that had supported its findings with solid data." It also made clear that preserving land would enhance tourism values and other benefits.

Pima County held a referendum for a land conservation program in May 2004. The referendum was successful, passing with approximately 67 percent of the vote. The referendum designated $112 million specifically for a "Habitat Protection Priorities" program, for purchase of

[15] Personal communications with Kristin Lee, research analyst at ECONorthwest, and Susan Shobe, assistant director of the Coalition for Sonoran Desert Protection, to Stan Wellborn (RFF).

lands identified as ecologically sensitive by the Sonoran Desert Conservation Project, plus $63 million for "community open space." The county has already spent over $31 million to acquire about 20,000 acres of land, and has obtained the grazing leases for another 75,000 acres of State Trust Lands. The ECONorthwest paper clearly was a prime factor in the overall process, not only in passing the referendum but in steering protection efforts toward ecologically sensitive lands.

IV. Conclusions

There are many reasons for protecting undeveloped lands on urban outskirts, including the ecological, aesthetic, and recreational. Information about these values can play a vital role for stakeholders in persuading decision makers to protect the lands. It can also play a vital role in setting priorities for lands to target and in shaping strategies to protect them. Nevertheless, this review suggests four ways in which research into values for open space at urban outskirts fails to connect cleanly with the activities of stakeholders and policymakers.

First, there is some tension between the priority households place on ecological conservation, such as protecting habitat and water quality, and the typical emphasis of land trusts to conserve agricultural lands. Under the right circumstances, preservation of agricultural lands can yield ecological values related to water quality and air quality, but usually not ecological values related to habitat (grazing lands may be an exception). Even with respect to water quality, agriculture can be a source of soil erosion and organic pollution. Accordingly, land trusts might consider revising their practices in response to such input. For example, research by ECONorthwest (2002), which emphasized ecological values of the Sonoran Desert near Tucson, has helped shape conservation initiatives in the direction of preserving ecological values.

Second, the importance of the public's ecological motives for preserving land is also inconsistent with the research strategies of economists and other analysts, much of which employs

property value methods than cannot recover ecological and other non-use values. This emphasis on hedonic studies may follow from the fact that the effect of preserved lands on housing prices—an observed market outcome—is more persuasive to economists than the hypothetical surveys associated with stated preference. Yet even stated preference studies, which in principle can recover such values, have tended to target more agricultural lands where objective ecological values are likely to be small. This suggests a future agenda for stated preference research to target more ecologically valuable lands. A potentially useful approach would be for interdisciplinary teams of economists and ecologists to compare people's stated reasons for wanting to protect undeveloped land, their assessment of the ecological values of those lands, and objective measures of ecologists.

Another way that the economic literature is somewhat disconnected from the needs of stakeholders and policy-makers is in the emphasis on benefit-cost analysis. While benefit-cost decision rules are central in economic theory, and in many cases in federal regulations, they are not as important in the mind of local officials monitoring political support. Accordingly, studies that document political support at various levels of expense may be particularly important. Certainly, some of the studies which have played the greatest role in shaping land use plans, including Rosenberger and Walsh (1997) and Krieger (1999, 2004), have provided that kind of information. On the other hand, the failed conservation referendum in Loveland, CO, illustrates the peril of ignoring such information. That referendum sought more money than a recent study (Loomis et al. 1999) had suggested had support, and lost with only 43% of the vote.

For all these reasons, economic studies of the values of preserving lands on the urban fringe have had a mixed impact on the formation of the policies studied. Not surprisingly, academic studies focused on using the latest economic and statistical methods have generally not

been communicated into the policy process. Research by academics at land grant universities, on the other hand, is more likely to be communicated to local stakeholders, often with the assistance of extension agents. Naturally, so are studies directly commissioned by land trusts. Fortunately, a sort of "secondary market" for valuation studies of preserved lands has developed. ECONorthwest (2002) and Fausold and Lilieholm (1996) are some of the most cited and most influential reports on the value of preserving lands, but were not original research. Rather, they summarized the literature and packaged it for a more popular audience.

Of course, only the style, not the fundamental content, can be repackaged. With respect to the content of their research, economists are continuing to advance the ball. For example, they are given more care to spatial connections between land uses at different places and even different points in time (e.g. Irwin and Bockstael 2001, Irwin 2002, Riddel 2001). Even more recently, they are using equilibrium approaches that model, simultaneously, effects throughout the urban landscape, allowing forecasts of the impacts of land use changes at one place on other places (e.g. Walsh 2006, Wu and Cho 2003, and Wu 2006). However, this review suggests that if these developments are to have a real impact on local land use policy, we must learn, not only how to advance the ball, but how better to pass it forward to policymakers.

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